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QUANTITATIVE DETERMINATION OF NOA (Naturally Occurring Asbestos) IN ROCKS : COMPARISON BETWEEN PCOM AND SEM ANALYSIS

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The quantification of NOA (Naturally Occurring Asbestos) in a rock or soil matrix is complex and subject to numerous errors.
The purpose of this study is to compare two fundamental methodologies used for the analysis: the first one uses Phase Contrast Optical Microscope (PCOM) while the second one uses Scanning Electron Microscope (SEM).
The two methods, although they provide the same result, which is the asbestos mass to total mass ratio, have completely different characteristics and both present pros and cons.
The current legislation in Italy involves the use of SEM, DRX, FTIR, PCOM (DM 6/9/94) for the quantification of asbestos in bulk materials and soils and the threshold beyond which the material is considered as hazardous waste is a concentration of asbestos fiber of 1000 mg/kg.(DM 161/2012). The most used technology is the SEM which is the one among these with the better analytical sensitivity.(120mg/Kg DM 6 /9/94)

The fundamental differences among the analyses are mainly:
- Amount of analyzed sample portion
- Representativeness of the sample
- Resolution
- Analytical precision
- Uncertainty of the methodology
- Operator errors

Due to the problem of quantification of DRX and FTIR (1% DM 6/9/94) our Asbestos Laboratory (DIATI POLITO) since more than twenty years apply the PCOM methodology and in the last years the SEM methodology for quantification of asbestos content.
The aim of our research is to compare the results obtained from a PCOM analysis with the results provided by SEM analysis on the base of more than 100 natural samples both from cores (tunnel-boring or explorative-drilling) and from tunnelling excavation .
The results obtained show, in most cases, a good correlation between the two techniques. Of particular relevance is the fact that both techniques are reliable for very low quantities of asbestos, even lower than the analytical sensitivity.
This work highlights the comparison between the two techniques emphasizing strengths and weaknesses of the two procedures and suggests how an integrated approach, together with the skills and experience of the operator may be the best way forward in order to obtain a constructive improvement of analysis techniques.